

### REMARKS

Favorable reconsideration of this application, in view of the present amendment and in light of the following discussion, is respectfully requested.

Claims 33, 37-39, 41-42, 47-49, 51, 53 and 55-59 are pending, with claims 33, 42, 51 and 58 amended, and claims 34, 40, 44, 50, 52 and 54 cancelled without prejudice or disclaimer, by the present application. Claims 33, 42 and 51 are independent.

In the Official Action, claims 42 and 58 were objected to; claims 33-34, 37-41, 51-54 and 59 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Emerson (U.S. Patent Pub. No. 2003/0006418) in view of Tanizawa (U.S. Patent Pub. No. 2003/0205711) and Vaudo (U.S. Patent No. 6,440,823); and claims 42, 44, 47-50 and 55-58 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Emerson in view of Vaudo and Tanizawa. These rejections are respectfully traversed.

Claims 42 and 58 are amended as suggested by the Official Action in response to the objections thereof. Claims 33, 42 and 51 are amended to recite features related to those of previously pending claims 34/40, 44/50, and 52/54, respectively. Claims 33, 42 and 51 are further amended to more clearly describe and distinctly claim Applicant's invention. Support for this amendment is found in Applicant's originally filed specification. No new matter was added.

Briefly recapitulating, amended claim 33 is directed to:

A light emitting diode (LED), comprising:  
a first gallium nitride layer having a first conductivity;  
a super lattice structure including InGaN on the first gallium nitride layer,  
wherein the super lattice structure is not doped with an n-type impurity,

wherein the super lattice structure includes a plurality of first InGaN layers and a plurality of second InGaN layers,

*wherein each of the plurality of first InGaN layers has an In composition less than an In composition of each of the plurality of second InGaN layers; and*

*wherein the first InGaN layer is directly on the first gallium nitride layer;*

an active layer on the super lattice structure and including an InGaN/InGaN structure of a multi-quantum well structure,

*wherein the active layer is directly on one of the plurality of second InGaN layers; and*

a second gallium nitride layer having a second conductivity on the active layer,

wherein the super lattice structure including InGaN has a plurality of pits formed thereon, and

wherein a non-zero number of the plurality of pits is 50 or less per area of  $5\mu\text{m} \times 5\mu\text{m}$ .

Applied Fig. 1 of Emerson is reproduced below.

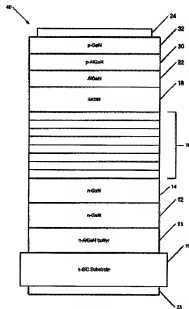


Figure 1

The applied structure of Emerson includes silicon doped GaN layer 14, superlattice 16 that includes alternating layers of silicon-doped GaN and/or InGaN, and an active region 18 having a multi-quantum well structure. However, while Emerson's active region 18 is directly on superlattice 16, Emerson's active region 18 is not directly on one of the plurality of second InGaN layers, the plurality of second InGaN layers having an In composition more than an In composition of each of a plurality of first InGaN layers. That is, Emerson's superlattice structure 16 includes alternating layers of  $\text{In}_X\text{Ga}_{1-X}\text{N}$  and  $\text{In}_Y\text{Ga}_{1-Y}\text{N}$ , with X being between 0 and 1 inclusive and X being not equal to Y. However, Emerson does not disclose or suggest a) *each of the plurality of first InGaN layers has an In composition less than an In composition of each of the plurality of second InGaN layers*. Regarding the relationship between X and Y, Emerson only notes that  $X \neq Y$  and, preferably,  $X=0$ . First, if  $X=0$ , then Emerson's  $\text{In}_X\text{Ga}_{1-X}\text{N}$  is merely GaN, and is not equivalent to any of Applicant's InGaN layers. Second, Emerson does not describe a relationship between  $\text{In}_X\text{Ga}_{1-X}\text{N}$  and  $\text{In}_Y\text{Ga}_{1-Y}\text{N}$ , where  $0 < X < Y$ . Accordingly, amended claim 33 patentably defines over Emerson for a first reason.

Also, because Emerson does not disclose or suggest a) each of the plurality of first InGaN layers has an In composition less than an In composition of each of the plurality of second InGaN layers, Emerson also does not disclose or suggest b) *the first InGaN layer is directly on the first gallium nitride layer*; and c) *the active layer is directly on one of the plurality of second InGaN layers*. Thus, for a second and third reason, amended claim 33 patentably defines over Emerson.

Applicant submits that amended independent claims 42 and 51 patentably define over Emerson for reasons similar to those discussed above relative to amended independent claim 33.

Applicant has considered Vaudo and Tanizawa and submits these references do not cure the deficiencies of Emerson. Indeed, it is not possible to cure the deficiencies of Emerson because Emerson explicitly teaches doping superlattice 16 with an n-type impurity, and thus teaches away from Applicant's claimed invention.

As none of the cited art, individually or in combination, disclose or suggest at least the above-noted features of independent claims 33, 42 and 51, Applicant submits the inventions defined by claims 33, 42 and 51, and all claims depending therefrom, are not rendered obvious by the asserted references for at least the reasons stated above.

MPEP 2141 notes that an obviousness-type rejection must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art. MPEP 2141 goes on to list exemplary rationales that may support a conclusion of obviousness. However, Applicant submits that the Official Action and the applied references present no objective evidence that would support an obviousness-type rejection of Applicant's amended claims based on one of these exemplary rationales.

### **CONCLUSION**

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Michael E. Monaco, Reg. No. 52,041, at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§ 1.16 or 1.147; particularly, extension of time fees.

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Respectfully submitted,

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